Army Alpha, Army Brass, and the Search for Army Intelligence

*By John Carson**

ON 6 APRIL 1917 THE UNITED STATES CONGRESS declared war on Germany. American psychologists lost little time in following suit. That very day the Society of Experimentalists, a group of about forty psychologists meeting at Harvard University, proposed a number of ways in which psychology might be applied to the incipient war effort and drafted a list of suggestions that, in broad terms, would guide psychologists' attempts to aid the American military for the next year and a half. The complex of motives, ranging from patriotism to professional opportunism, that informed the actions of these psychologists and the programs they initiated have been ably analyzed by a number of historians, including Thomas Camfield, Daniel Kevles, Franz Samelson, and Richard von Mayrhauser.[1] In this essay I will build on their efforts by examining in detail one episode in the relationship between psychology and the American military during World War I—the decision to establish a program of army-wide intelligence testing—in order to investigate what can happen when members of a particular scientific community, in this case American psychology, must persuade a different community, the military, of the value and authority of their knowledge and practices. It is a story of negotiation and transformation.

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[1] See Leonard W. Ferguson, *The Heritage of Industrial Psychology*, nos. 8–12 (Hartford, Conn.: Finlay, 1963–1968); Thomas M. Camfield, "Psychologists at War: The History of American Psychology and the First World War" (Ph.D. diss., Univ. Texas, 1969); Daniel J. Kevles, "Testing the Army's Intelligence: Psychologists and the Military in World War I," *Journal of American History*, 1968, *55*:565–581; Joel H. Spring, "Psychologists and the War: The Meaning of Intelligence in the Alpha and Beta Tests," *History of Education Quarterly*, 1972, *12*:3–15; Franz Samelson, "World War I Intelligence Testing and the Development of Psychology," *Journal of the History of the Behavioral Sciences*, 1977, *13*:274–282; Samelson, "Putting Psychology on the Map: Ideology and Intelligence Testing," in *Psychology in Social Context*, ed. Allan R. Buss (New York: Irvington, 1979), pp. 103–168; Stephen J. Gould, *The Mismeasure of Man* (New York: Norton, 1981), pp. 192–233; Richard T. von Mayrhauser, "The Triumph of Utility: The Forgotten Clash of American Psychologies in World War I" (Ph.D. diss., Univ. Chicago, 1986); von Mayrhauser, "The Manager, the Medic, and the Mediator: The Clash of Professional Psychological Styles and the Wartime Origins of Group Mental Testing," in *Psychological Testing and American Society, 1890–1930*, ed. Michael M. Sokal (New Brunswick, N.J.: Rutgers Univ. Press, 1987), pp. 128–157; von Mayrhauser, "Making Intelligence Functional: Walter Dill Scott and Applied Psychological Testing in World War I," *J. Hist. Behav. Sci.*, 1989, *25*:60–72; and von Mayrhauser, "The Practical Language of American Intellect," *History of the Human Sciences*, 1991, *4*:371–393.

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One of the most significant features of psychology's entry into the American military is that it involved persuasion across community boundaries. While this is by no means a unique phenomenon in the history of science, in recent years most studies of the place of persuasion in the constitution of authoritative knowledge (knowledge that within a given community is deemed both valid and relevant to the concerns and activities of that community) have focused on persuasion *within* a community of peers. Thus it is an open question to what degree the pictures advanced by Bruno Latour and Steve Woolgar or Steven Shapin and Simon Schaffer of science as an immensely flexible, negotiated endeavor can be applied when the need to convince crosses community boundaries.[2] The waters are muddied still further by the somewhat conflicting findings of Peter Galison and those scholars who have analyzed the role of audience in science. Galison, in his "trading zone" model for the transmission of knowledge between distinct cultural groups, emphasizes the independence and isolation of knowledge-producing groups. Although the instrument-makers, experimenters, and theorists that form the basis for his study desire to "sell their wares," they attempt to do so, in Galison's account, with little direct input from the potential consumers of their knowledge products. However, recent works on the role of audience in the production of scientific knowledge, like those of John Law and R. J. Williams or Kurt Danziger, have painted a much different picture, one in which the consumers of knowledge products have a profound influence on producers. As Danziger has noted, "they [new knowledge products] must become marketable, and that means that there must be categories of persons to whose interests the new product is able to appeal."[3]

The case of the entrance of psychological testing into the American army suggests, I will argue, a middle position between these two kinds of accounts of interactions across community boundaries. Because psychologists desired to persuade the military—a group with its own distinct norms and practices—that psychological expertise could be of value, they were forced to acknowledge this outside audience and to make accommodations to its needs and mores. There were definite limits to this process of adaptation, however, because the standards and practices of their own profession bound the psychologists as well. Robert M. Yerkes, the leader of the military testing program, caught this tension succinctly when he assured Navy Surgeon General William C. Braisted, early in May 1917, that "we wish to make our expert knowledge serviceable to military authorities."[4] *Expert* and *serviceable* are the telling words here. On the one hand, as a provider of "expert" knowledge, Yerkes presumed both that his knowledge was authoritative and that it would carry weight with a lay public. On the other hand, as someone desiring to provide "serviceable" knowledge, Yerkes suggested that there would have to be some adaptation of that knowledge to the needs and particularities of his client. The result was a constant ebb and flow, in which both the psychologists and the military oscillated between accommodating and resisting change in the process of negotiating a *modus vivendi* acceptable to both and a domain of knowledge that both could deem valid and useful.

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[2] See, e.g., Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts* (Beverly Hills, Calif.: Sage, 1979); Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N.J.: Princeton Univ. Press, 1985); JoAnne Brown, "Mental Measurements and the Rhetorical Force of Numbers," in *The Estate of Social Knowledge*, ed. Brown and David K. van Keuren (Baltimore: Johns Hopkins Univ. Press, 1991); Peter Dear, "*Totius in Verba:* Rhetoric and Authority in the Early Royal Society," *Isis*, 1985, *76*:145–161; Alan G. Gross, "Persuasion and Peer Review in Science: Habermas's Ideal Speech Situation Applied," *Hist. Hum. Sci.*, 1990, *3*:195–209; Philip Kitcher, "Persuasion," in *Persuading Science: The Art of Scientific Rhetoric*, ed. Marcello Pera and William R. Shea (Canton, Mass.: Science History Publications, 1991); and Donald N. McCloskey, "The Rhetoric of Economics," *Journal of Economic Literature*, 1983, *21*:481–517.

[3] See Peter Galison, "History, Philosophy, and the Central Metaphor," *Science in Context*, 1988, 2:197–212; John Law and R. J. Williams, "Putting Facts Together: A Study of Scientific Persuasion," *Social Studies of Science*, 1982, *12*:535–558, esp. p. 554; and Kurt Danziger, *Constructing the Subject: Historical Origins of Psychological Research* (Cambridge: Cambridge Univ. Press, 1990), p. 181. In Danziger's book see esp. Ch. 7, "Marketable Methods," and Ch. 11, "The Social Construction of Psychological Knowledge."

BEFORE AND AFTER: A GENERAL OVERVIEW

The story of the adoption of "intelligence" as a psychological criterion by the United States Army is, in some senses, little short of spectacular. Throughout the nineteenth and early twentieth centuries the American military evinced virtually no interest in "intelligence," at least in "intelligence" as connoting the cognitive powers of the mind. This is not to say that judgments about how relatively smart or dumb enlisted men or officers might be were absolutely avoided. It is undoubtedly the case that individuals sometimes drew conclusions about the intellectual capabilities of their fellow soldiers. But what *is* true is that in the official language military personnel used to describe their peers and subordinates—their public language—"intelligence" was not a salient feature.

The silence about "intelligence" in the army's public language is most clearly revealed in its formal regulations, especially those detailing the minimum requirements for new recruits and the characteristics on which officers were to be rated in their performance evaluations, known as efficiency reports.[5] Prior to World War I character, not intelligence, loomed large in official army documents. Army regulations concerning recruit eligibility, for example, were based solely on the following criteria: candidates for enlistment had to be older than eighteen and younger than thirty-five; citizens or intending to become citizens; able to read, write, and speak English; and not convicted felons, deserters, insane, or intoxicated.[6] Similarly, in the actual assessments produced during the prewar period, emphasis was placed on the kind of person the officer was, his ability to lead and discipline his men, the skill and energy with which he fulfilled his duties, his judgment, his appearance, and whether he had had any problems with money or drink.[7] In 1903, for example,

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[4] Robert Yerkes to William C. Braisted, 5 May 1917, American Psychological Association (APA): Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, National Research Council Papers, Washington, D.C. (hereafter cited as **NRC Papers**).

[5] For the General Orders see G.O. No. 128, 12 July 1906, in U.S. Adjutant General's Office, *General Orders and Circulars: War Department—1906* (Washington, D.C.: Government Printing Office, 1907). Although the efficiency report form went through a number of versions between the late 1890s and 1917, it retained the basic flavor of the 1895 version, which began with a summary page asking for assessments in nine areas, including "Capacity for command," "Professional zeal, etc.," "Conduct and habits," "Can he be trusted with important duties?" and "Is he qualified mentally, morally, and physically for all the duties of his position?" For a continuous run of efficiency report forms from 1895 to 1917 see file 1100—Frederick G. Lawton, box 13, Record Group (RG) 94: Office of the Adjutant General—Document Files, National Archives, Washington, D.C. (hereafter cited as **AGO, pre-1917**).

[6] See, e.g., G.O. No. 130, paragraphs 857–860, 16 July 1906, in U.S. Adjutant General's Office, *General Orders and Circulars, 1906*.

[7] For the pre-1917 period there is no single file among the archives of the Adjutant General's Office containing only officer efficiency reports. Rather, efficiency reports, if kept, can be found under the

Lieutenant Sylvester Bonnaffon 3rd was described on his efficiency report form as "Resourceful. An excellent officer and of extremely courteous demeanor and gentlemanly bearing." By 1916, then Captain Bonnaffon had become "A 'Very Good' officer. Has good habits. Cheerful disposition + a loyal subordinate. His stoutness has never interfered with his 'hiking' qualities that I know of." Explicit assessments of an officer's intelligence or mental capacity in any sense were rare in the extreme.[8]

Such was not the case by the end of the war. Through the efforts of the army's Committee on Classification of Personnel, headed by psychologist Walter Dill Scott of the Carnegie Institute of Technology, new efficiency report forms were developed that mandated numerical ratings in five separate areas: Physical Qualities, Military Leadership, Character, General Value to the Service, and Intelligence. At the same time, in a program directed by psychologist Robert Yerkes of the Army Surgeon General's Office and Harvard University, more than 1.75 million soldiers were subjected to the now-famous army intelligence tests, Army Alpha for literates and Army Beta for illiterates, from which were produced intelligence ratings intended to become part of each examinee's permanent army service record.[9] Finally, as reflected in the many official and semiofficial reports that officers were required to prepare on one another, over the course of the war "intelligence" became a characteristic that officers increasingly noticed and commented on when assessing their subordinates and explaining successes or failures. On 22 July 1918, for example, Brigadier General L. C. Andrews was described as "an excellent, well-equipped, all around officer, intelligent and competent"; while of Lieutenant Colonel A. M. Shipp, his brigade commander remarked that "while probably lacking the vision ever to become a brilliant officer . . . he has the qualifications and faithfulness to duty to make an excellent officer in command of a unit in a larger organization."[10] As these reports suggest, by 11 November 1918—Armistice Day—"intelligence" had become a real presence in the American military.

The beginnings of an explanation for this change are not difficult to come by. From the standpoint of the history of the human sciences, only as American in-

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names of individual officers in the Adjutant General's Office document files. I have consulted the records of the following individuals: John S. Battle, file 1112, box 13; Sylvester Bonnaffon 3rd, file 267109, box 1170; Francis P. Casey, file 21234, box 148; Frederick G. Lawton, file 1100, box 13; Paul Murray, file 1831514, box 6677; and William Townsend, file 1488113, box 5678; all in AGO, pre-1917. For each, there is a relatively complete run of their year-by-year efficiency reports from the time they entered the service up to 1917.

[8] See efficiency reports on Bonnaffon for 1903 and 1916 in file 267109—Sylvester Bonnaffon 3rd, box 1170, AGO, pre-1917. Even though, as of 1904, the efficiency report form asked for an assessment of "intelligence and judgment shown in instructing, drilling, and handling men," this was *not* taken as an opportunity to remark on the officer's intelligence in general, and indeed seems always to have been read as asking how well the officer handled enlisted men.

[9] Examples of the new efficiency report form are published in U.S. Adjutant General's Office, *The Personnel System of the United States Army*, Vols. 1–2 (Washington, D.C.: Government Printing Office, 1919). For a history of the development of the form see von Mayrhauser, "Practical Language of American Intellect" (cit. n. 1). For the official history of the army testing project during World War I see Robert M. Yerkes, ed., *Psychological Examining in the United States Army* (Memoirs of the National Academy of Sciences, 15) (Washington, D.C.: Government Printing Office, 1921).

[10] Colonel H. O. Williams, Inspector General, memo to Adjutant General of the Army, 22 July 1918, file 201.6 (8-20-18 to 7-22-18), box 304, RG 407: Adjutant General's Office—Central Decimal Files, 1917–1925, National Archives, Washington, D.C. (hereafter cited as **AGO, 1917–1925**). There is no one comprehensive source for efficiency reports and other ratings of personnel during World War I. For some examples see file 201.6, box 304; file 220.12 (11-8-24 to 5-13-17), box 416; and file 220.81: Honorable Discharges—1917, box 460; all in AGO, 1917–1925.

volvement in the war was beginning had psychology both attained sufficient cultural status and developed appropriate techniques that psychological notions of "intelligence" could possibly reach a wider public.[11] Psychology was just emerging as an autonomous professional endeavor by the start of the war, and American psychology's interest in intelligence had not really borne fruit, in any practical sense, until new methods for the measurement of intelligence—devised by the French psychologist Alfred Binet in the period from 1905 to 1911—were adapted for American use by Henry H. Goddard and most especially Lewis M. Terman, who in 1916 produced his Stanford Revision of the Binet-Simon Intelligence Scale.[12] Thus, for most of the preceding period, there would have been few outside pressures for the army to employ the concept of "intelligence," at least as this concept was understood within psychology.

From the perspective of military history, the United States Army at the turn of the century was an institution that required few sophisticated techniques to assess its personnel. Small—circa 6,000 officers and 200,000 soldiers even in March 1917—led by an officer corps trained primarily at West Point, and composed of career soldiers, the American army of the prewar years was a relatively intimate, almost small-town organization in which soldiers could be placed and rated on the basis of long-term familiarity and a well-entrenched military culture could easily be maintained and propagated.[13] Although there were groups within the military interested in reforming it along more progressive, "scientific," lines, they had achieved few successes before 1917. Everything changed, however, with mobilization for the war. In only a few months the American army grew dramatically in size—ultimately 17-fold, with over 3.5 million soldiers in arms by November 1918, including more than 200,000 officers. With this enormous growth came tremendous stresses on the traditional military system.

First, the very scale of the increase and the urgency of the war situation meant that many of the methods for selecting, training, and organizing a peacetime army were no longer easily applicable. Whereas officers had been able to rely on intimate

[11] See, e.g., Samelson, "World War I Intelligence Testing" (cit. n. 1), pp. 274–276; Thomas M. Camfield, "The Professionalization of American Psychology," *J. Hist. Behav. Sci.*, 1973, *9*:66–75; and, for general background, Dorothy Ross, *The Origins of American Social Science* (Cambridge: Cambridge Univ. Press, 1991).

[12] For more information on the Stanford-Binet and the early history of intelligence testing in America see Sokal, ed., *Psychological Testing and American Society* (cit. n. 1); Raymond E. Fancher, *The Intelligence Men: Makers of the IQ Controversy* (New York: Norton, 1985); Paul D. Chapman, *Schools as Sorters: Lewis M. Terman, Applied Psychology, and the Intelligence Testing Movement, 1890–1930* (New York: New York Univ. Press, 1988); Henry L. Minton, *Lewis M. Terman: Pioneer in Psychological Testing* (New York: New York Univ. Press, 1988); Joseph Peterson, *Early Conceptions and Tests of Intelligence* (Yonkers: World Book, 1925); and Clarence J. Karier, "Testing for Order and Control in the Corporate Liberal State," *Educational Theory*, 1972, *22*:154–180.

[13] Kevles makes much the same point about the military in 1917 in "Testing the Army's Intelligence" (cit. n. 1), p. 567. Exact data on the size of the army both just before the outbreak of the war and by November 1918 can be found in U.S. Adjutant General's Office, *Personnel System* (cit. n. 9), Vol. 1, Ch. 2. During the period 1900–1915 the size of the regular army varied from about 64,000 to 108,000, with between 3,468 and 5,175 officers; see Russell F. Weigley, *History of the United States Army* (Bloomington: Indiana Univ. Press, 1984), pp. 598–599. For more information on the pre–World War I army see John W. Chambers, *To Raise an Army: The Draft Comes to Modern America* (New York: Free Press, 1987), esp. Chs. 1–5; Robert H. Ferrell, *Woodrow Wilson and World War I, 1917–1921* (New York: Harper & Row, 1985), esp. pp. 14–15; and Weigley, *History of the U.S. Army*, esp. pp. 265–354. For more on the nature of West Point both before and after World War I see Roger H. Nye, "The United States Military Academy in an Era of Educational Reform, 1900–1925" (Ph.D. diss., Columbia Univ., 1968).

knowledge of individuals under their command and on the slow integration of a few new recruits into an essentially stable military organization, the war brought a huge influx of new soldiers who needed quickly to be trained, assigned to tasks where their skills could best be taken advantage of, and given leaders—both line officers and noncommissioned officers. As Secretary of War Newton D. Baker noted in an address to personnel adjutants in the summer of 1918,

> We have no time for men to grow up into those groups evolved by association, but we have to have a selective process by which we will get the round men for the round places, the strong men for the strong tasks and the delicate men for the delicate tasks. . . . Some system of selection of talents which is not affected by immaterial principles or virtues, no matter how splendid, something more scientific than the haphazard choice of men, something more systematic than preference or first impression, is necessary to be devised.[14]

For Baker, as for many American leaders at this time, it was the "scientific," equated with the "systematic" and the "objective," that provided the key to solving the problem of how to organize the great agglomeration of men brought into the military by the war.

Second, the rapid increase in the number of soldiers required a drastically supplemented officer corps. West Point could no longer supply enough officers, and the consequent temporary appointment of experienced enlisted men and, in particular, inexperienced, usually college-educated members of the middle and upper-middle classes meant that traditional military culture, already changing in response to the inroads of Progressivism, was subjected to a host of new influences. Third, as a consequence of the vast scale of the recruitment, and especially the draft, a much wider variety of Americans entered the military than at any time since the Civil War. The enormous intellectual and cultural, not to mention linguistic, differences arising from a century of intense immigration and urbanization and from the creation of a large free African-American population presented challenges for which officers trained under traditional military methods were little prepared.[15]

The result of all of these pressures was not to destroy traditional military culture, but to create space in it for new possibilities, especially ones that could expand and reshape existing practices in order to cope with the new world of the mass army. The story of the entrance of "intelligence" into the American military is the story of how a group of American scientists, in the process of offering their services to the nation and of furthering their own profession, attempted to exploit this niche, and of how in doing so they transformed both the knowledge they proffered and the cultures in which both they and their audience lived.

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[14] Newton D. Baker, in *Personnel,* 21 Aug. 1918, *1*:1–4, folder 1785, box 94, Robert Yerkes Papers, Yale University Archives, New Haven, Connecticut (hereafter cited as **Yerkes Papers**). John W. Chambers discusses parallel developments in the reorganization of military recruiting according to scientific principles in *To Raise an Army.*

[15] Russell Weigley notes, "There was a desperate shortage of officers and n.c.o.'s": Weigley, *History of the U.S. Army* (cit. n. 13), pp. 372–373. On the variety of new recruits see esp. Bruce White, "The American Military and the Melting Pot in World War I," in *The Military in America: From the Colonial Era to the Present,* ed. Peter Karsten (New York: Free Press, 1986). For more information on changes the army underwent as a consequence of rapid growth during the war see esp. Fred D. Baldwin, "The American Enlisted Man in World War I" (Ph.D. diss., Princeton Univ., 1964); Chambers, *To Raise an Army* (cit. n. 13), pp. 232–234; John G. Clifford, *The Citizen Soldiers: The Plattsburg Training Camp Movement, 1913–1920* (Lexington: Univ. Press Kentucky, 1972); Edward M. Coffman, *The Hilt of the Sword: The Career of Peyton C. March* (Madison: Univ. Wisconsin Press, 1968); David M. Kennedy, *Over Here: The First World War and American Society* (New York: Oxford Univ. Press, 1982); Jack C. Lane, *Armed Progressive: General Leonard Wood* (San Rafael, Calif.: Presidio, 1978); and Timothy K. Nenninger, *The Leavenworth Schools and the Old Army: Education, Professionalism, and the Officer Corps of the United States Army, 1881–1918* (Westport, Conn.: Greenwood, 1978).

YERKES AND ARMY *a*

Robert Yerkes began his formal campaign to persuade the military to establish a program of army-wide intelligence testing on 29 April 1917. On that day, as chair of the National Research Council Committee on Psychology's subcommittee on the psychological examination of recruits, he presented Surgeon General William C. Gorgas of the Army Medical Corps with his *Plan for the Psychological Examining of Recruits to Eliminate the Mentally Unfit,* completed just three days earlier. Designed to uncover recruits with "intellectual deficiency, psychopathic tendencies, nervous instability, and inadequate self-control," Yerkes's program proposed the administration of a ten-minute mental test, individually, to any army recruit for whom, in consultation with the medical officer or commanding officer, "special psychological examination is indicated by exceptional or unsatisfactory behavior."[16] Those scoring "inferior" on the initial assessment, the plan envisioned, would receive a more complete battery of tests, with recommendations to the training camp medical officer about discharge based on the results of this more extensive examination.

In most respects, the plan that Yerkes developed adhered closely to the practices and presumptions then common within American psychology. Like the Stanford-Binet and his own Yerkes-Bridges Point Scale, Yerkes's army program was focused on the measurement of intelligence, oriented primarily toward the detection of mental deficiency, and designed to be individually administered at the hands of trained experts.[17] However, even at this stage two features of Yerkes's plan reflected the particular influence of the American military. In the context of an army that inducted only adults, Yerkes abandoned civilian mental testing's preoccupation with schoolchildren and the feebleminded and proposed instead the development of an instrument to measure adult intelligence. And faced with the prospect of thousands of recruits entering the services every day, Yerkes avoided the slow (forty-five minutes to one hour) and painstaking examinations characteristic of prewar intelligence testing and suggested instead the creation of an instrument that could sift candidates rapidly, relegating the more time-consuming methods to use with those (presumably few) recruits found to be of questionable intelligence.

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[16] Robert M. Yerkes, *Plan for the Psychological Examining of Recruits to Eliminate the Mentally Unfit,* pp. 1, 2, file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers. See also Yerkes's entries for 26 and 29 Apr. 1917, *War Diary,* folder 2663, box 171, Yerkes Papers. For more on Yerkes see Donna Haraway, *Primate Visions: Gender, Race, and Nature in the World of Modern Science* (New York: Routledge, 1989), esp. pp. 59–83; James Reed, "Robert M. Yerkes and the Mental Testing Movement," in *Psychological Testing and American Society,* ed. Sokal (cit. n. 1), pp. 75–94; and von Mayrhauser, "The Manager, the Medic, and the Mediator" (cit. n. 1).

[17] The focus on eliminating the mentally unfit also derived from Yerkes's acquaintance, via a one-week tour in mid April of Canadian hospitals and military institutions, with Canada's experience in the war and the great importance placed by Canadian military officials on eliminating mental defectives from service. See Carl C. Brigham to Yerkes, 26 Mar. 1917, file: Committee on Psychology: Subcommittee on Incapacity, Reeducation, Vocational Training: Executive Committee—1917, NRC Papers; and Yerkes's report of his trip in Yerkes to George E. Hale, 16 Apr. 1917, file: Committee on Psychology: General; Executive Committee—April 1917, NRC Papers. For information on the Yerkes-Bridges Point Scale see Robert M. Yerkes, James W. Bridges, and Rose S. Hardwick, *A Point Scale for Measuring Mental Ability* (Baltimore: Warwick & York, 1915); and Yerkes, "The Binet versus the Point Scale Method of Measuring Intelligence," *Journal of Applied Psychology,* 1917, *1*:111–122.

In the months that followed—from May 1917 to January 1918—this process of moderated accommodation persisted and accelerated as Yerkes and his fellow committee members attempted to bring his sketchy program for testing the nation's recruits into being. After receiving a tentative expression of interest from Army Surgeon General Gorgas on 1 May 1917—an interest not matched by Navy Surgeon General Braisted—Yerkes sought funding to develop the new measuring instruments his plan envisioned.[18] Having garnered support from a number of private groups, he convened his committee at the New Jersey Training School for Feebleminded Girls and Boys in Vineland from 28 May to 9 June and again from 25 June to 7 July 1917.[19] There Yerkes, Walter V. Bingham, Henry H. Goddard, Thomas H. Haines, Lewis M. Terman, Frederic L. Wells, and Guy M. Whipple—almost all prominent figures in the field of psychological testing—went about the business of designing mental measurement instruments that could be used with army recruits.

Goaded, no doubt, by a month of conversations since the development of Yerkes's *Plan* about methods for pursuing military examining, the committee members decided in the first two days to make a number of important breaks both with Yerkes's proposal and with common civilian testing procedures. Reconceiving the examination entirely, the committee decided to develop multiple forms of a forty-five-minute multiple-choice group examination, to be administered to all recruits for the purpose of identifying the exceptionally superior as well as the inferior.[20] In part, these changes reflected the diverse interests of the particular psychologists involved. Both Terman and Bingham, for example, were very concerned with the upper end of the intelligence spectrum, and both had been experimenting with the technology of group mental testing before coming to Vineland.

In large measure, however, two other factors were critical in the decision to alter Yerkes's plan. First, for reasons that are not entirely clear, the committee chose to recommend that a psychological examination be given to every recruit. Whether out of scientific curiosity, a desire to differentiate military psychology from medicine and psychiatry, or a belief that universal intelligence rating would provide the military with the most help in classifying and placing its soldiers, the decision to test all soldiers meant that some sort of rapidly administerable and scorable group test would have to be the principal method of psychological examination. No other approach would have been feasible, given the magnitude of the examining task.

Second, the psychologists' growing appreciation of the needs and concerns of the

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[18] Yerkes wrote Surgeon General Braisted of the navy to ask for an appointment to discuss methods for psychologically examining recruits; Braisted declined to meet with Yerkes on the grounds that psychological methods could not eliminate *only* undesirables and that navy medical officers could make the necessary evaluations of navy personnel without recourse to psychologists or their examinations. See Yerkes to Braisted, 5 May 1917; and Braisted to Yerkes, 8 May 1917; both in file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers.

[19] Yerkes had been in contact with Joseph P. Byers, Executive Secretary of the Committee on Provision for the Feebleminded, since at least 10 Apr. 1917. Not only did Byers's group agree to provide $700 for the development of the new military psychological instruments, but Byers himself lobbied the secretary of war for the adoption of a program of recruit screening. For more information see Joseph P. Byers to Secretary of War, 10 Apr. 1917; Byers to Yerkes, 19 Apr. 1917; Byers to Yerkes, 23 Apr. 1917; and Yerkes to Byers, 4 May 1917; all in file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers.

[20] See Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 299.

Table 1

Tests in Army a *and Their Contribution to Total Score*

1. Following oral directions: 4%
2. Displaying memory span: 5%
3. Rearranging sentences: 8%
4. Solving arithmetical problems: 8%
5. Answering general info. questions: 16%
6. Giving synonyms or antonyms: 16%
7. Displaying practical judgment: 4%
8. Solving number series: 6%
9. Giving analogies: 16%
10. Doing number comparisons: 16%

military meant that they were aware of issues—like malingering, cheating, and the importance of rapid administration and scoring—that had not arisen in civilian mental testing. There had been no need for multiple forms to prevent cheating or for multiple-choice answering to allow quick, objective scoring when individually examining children or the feebleminded. In the military, however, things were different, as Yerkes was made acutely aware when the navy rejected his overtures explicitly because of worries that malingerers might manipulate psychological methods to avoid their "proper" service. Communications with other military officials—and indeed within the psychological community itself—confirmed that the fear of civilian malingering was pervasive among military officials. These conversations also indicated that any new methods employed by the army or navy would have to fit into the accelerated training schedules adopted by both services as they prepared for war.[21]

Having in the first two days redefined central aspects of its endeavor, the committee devoted the remainder of its first week at Vineland to building the new intelligence-measuring instrument. Because intelligence scales during the early twentieth century were typically created by putting together a collection of discrete tests, the task before the committee was to choose, from among the existing repertoire of tests and from others that could quickly be devised, those that seemed suitable for the new instrument.[22] Each proposed test, the committee decided, would be evaluated on twelve criteria, which included "adaptability for group use," "validity as a measure of intelligence; that is, its correlation with other measures of intelligence of known validity," "the range of intelligence measured," objectivity and rapidity of scoring, unfavorableness to coaching, malingering, or cheating, "independence from schooling," and "economy of time."[23] By week's end, after seriously investigating thirteen tests, the committee assembled ten as the first army intelligence scale, dubbed Army *a* (see Table 1).

Army *a* marks, in many respects, a significant break with civilian intelligence-measuring instruments. Although the individual tests were based on commonly used methods, economy of time, security, measurement across a broad spectrum, and adaptability to group use were features not particularly salient within civilian testing. Even more unusual, however, was the orientation of the test toward the production of quantified results completely objectively determined. Up until this point most mental tests had required the mediation of a trained professional—an expert was needed to administer the tests, judge the answers, and interpret the results. But the Vineland committee designed an instrument where technology was substituted for professional skill and where only quantitative data of the most minimal sort—a single number—would be generated. While the output might in some sense be a measure of the same entity, intelligence, assessed by civilian psychologists, the extent of the information produced was enormously reduced and the role of the psychologist in the process profoundly altered. Whereas hitherto one of a psychological examiner's primary duties had been to interpret examinee behavior, with Army *a* data interpretation became the essence of the psychologist's job and, in short order, the badge of his or her expertise. Confronted with a military drafting thousands every day, and desiring to examine them all, the Vineland committee completed a process—already begun, to be sure, within civilian psychology—of remaking mental testing into a new sort of endeavor, one in which professional judgment was subordinated to objective determination and statistical manipulation.[24]

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[21] For worries about malingerers see Braisted to Yerkes, 8 May 1917, file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers. For concern about fitting testing into accelerated training schedules see, e.g., James Angell to Hale, 23 May 1917, file: Committee on Psychology: General; Executive Committee—April 1917, NRC Papers; and Maj. Edgar King to Yerkes, 27 May 1917; Dr. Samuel Fernberger to Yerkes, 24 June 1917; and "Report of Dr. Yerkes," penciled date of 30 May 1917, but which may refer to a meeting mentioned in Yerkes's *War Diary* as taking place on 1 May; all in file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers.

[22] At age level 4 of the 1916 Stanford-Binet, for example, the examinees were required to compare lines, discriminate forms, count pennies, copy a square, show elementary comprehension, and repeat four digits. At age level 9, in contrast, they were required to give the date, arrange five weights, make change, repeat four digits reversed, use three words in a sentence, and find rhymes. While the Yerkes-Bridges Point Scale was not quite so heterogeneous, it too made use of a number of different tasks, though ones that could be used across age levels.

[23] Yerkes, ed., *Psychological Examining* (cit. n. 9), pp. 299–300.

The effects of this transformation of the mental test to fit into the new world of the mass army extended even to the level of the individual tests to be included in the examination. In discussing one of the tests excluded from Army *a*, for example, Yerkes pointed out that "it was generally agreed that the Trabue type of completion test is a better measure of intelligence than some of the other tests finally accepted, as for example, the number-comparison or memory-for-digits tests. However, the difficulties in securing alternative forms of this test and arranging it for response without writing and objective scoring were too great to be overcome in the time available."[25] The problem with the Trabue test was not that it had failed to meet psychological criteria of acceptability; it was judged an excellent measure of intelligence. However, that was not enough. It had to meet military criteria as well; failing them, it was rejected in favor of inferior measures of intelligence. Confronted with a choice between psychological and military standards, the Vineland psychologists proved willing to sacrifice, to a certain degree, even the construct they intended to measure in order to build an instrument that would fit army conditions and needs.

Tried out on 469 individuals at eight different institutions, Army *a* and the new approach to testing elicited many and varied reactions. Apparently neither asked nor moved to comment on the procedures developed for its use, the military said little directly, providing only tacit encouragement by approving a further trial of Army *a* at four military institutions. Psychologists, not surprisingly, reacted more vociferously, especially to the "mechanization" of the examining process. While a number applauded the committee for its work, many expressed reservations of one sort or another. Some simply remarked that the routinization of the process disinclined them to participate in examining recruits, because there would be no real demand for their particular expertise. Others, like H. C. McComas at Princeton, were more troubled, worried that, without qualitative data, quantitative ratings alone would not provide the kind of information necessary "if our purpose is to supply material which will enable an officer to classify his men." And, finally, there were those, like Edward L. Thorndike and James Angell, who dismissed the endeavor entirely, convinced that the testing program was impractical and would be of no real value to the service.[26]

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[24] Yerkes had already gone partway down this path in his creation of the Yerkes-Bridges Point Scale. See Yerkes *et al.*, *Point Scale for Measuring Mental Ability* (cit. n. 17); and Yerkes, "Binet versus the Point Scale Method" (cit. n. 17).

[25] Yerkes, ed., *Psychological Examining*, p. 301.

Yerkes had invested too much in the work to agree with the opinions of Thorndike and Angell. Nonetheless, he did not simply ignore the criticisms being leveled within parts of the psychological community. In July 1917 Yerkes issued a new proposal, his "Plan for Psychological Military Service," which formalized the decisions that had been made in Vineland and added a new feature that marked the next step in the evolution of Army *a*: the correlation of the psychological measurements "with the industrial and military history of the individuals examined." Stressing the need for "immediate military serviceableness," Yerkes declared that the classification of recruits "will prove serviceable in action in just so far as our psychological measurements correlate with the actual performance of soldiers and sailors." Echoing the response that he had made privately to McComas, Yerkes's decisions to use military performance as a criterion for evaluating intelligence instruments and to emphasize the need for "serviceableness" above other considerations indicate the extent to which he was willing to have the examination program judged by what he presumed would be the standards employed by military officials.[27]

These decisions also indicate the extent to which the military testing program had moved onto uncertain terrain. The call for correlations with military performance was not in and of itself unusual; Yerkes himself had argued in 1916 that it was important to correlate test results with "varied measures of efficiency in living." Rather, it was the lack of confidence that military officials would find the testing program "serviceable" that is most revealing. If the Vineland committee members had maintained the army testing program's sole focus on eliminating the unfit, it seems extremely unlikely that they would have felt much need to correlate test results with military performance. Psychologists knew that they knew how to detect the feebleminded. They also knew, and the military agreed with them, that a person below a certain degree of intelligence, whatever that degree might be, would not make a good soldier.[28] But the place of intelligence in determining *success* in various

[26] Among those who declined to participate see, e.g., Truman L. Kelly to Yerkes, 27 Aug. 1917, file 254, box 14, ser. 4, James Earl Russell Papers, Special Collections, Teachers College, Columbia University, New York; and Henry H. Goddard to H. W. Chase, 26 Nov. 1917, file: Correspondence C–D, box M614, Henry H. Goddard Papers, Archives of the History of American Psychology, University of Akron, Akron, Ohio. See also H. C. McComas to Yerkes, 2 July 1917; and Edward L. Thorndike to Yerkes, 23 July 1917; both in file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—July 1917, NRC Papers; and Angell to Hale, 23 May 1917 (cit. n. 21).

[27] See Robert M. Yerkes, "Description of Plan for Psychological Military Service," 16 July 1917; and Yerkes to McComas, 9 July 1917; both in file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—July 1917, NRC Papers.

[28] Yerkes, "Binet versus the Point Scale Method" (cit. n. 17), p. 122. Over two decades of eugenical worrying in America had made the notion that people below a certain level of intelligence could not make good soldiers a rather widespread belief, and army regulations had for some time specified mental incapacity as sufficient reason for the elimination of a potential recruit. See, e.g., *Regulations Governing Physical Examinations,* Form No. 11, Office of the Provost Marshall General (Washington, D.C.: Government Printing Office, 1917), p. 11.

human endeavors was more problematic. There was as yet no consensus, within either psychology or American culture in general, as to the degree, above a bare minimum, to which intelligence was a critical factor in individual achievement.

Thus the Vineland group's decision to identify superior intelligence and to classify all recruits confronted psychologists with the need to convince both themselves and their military audience that a person's intelligence either contributed to or substantially determined the uses to which he could profitably be put in the army. In the process of making that assessment, psychologists were forced to adopt military criteria of success as one of the benchmarks against which to calibrate their instruments. Many of the arguments that would rage in the ensuing year over the value of the testing program would center on this issue, debated as the extent to which intelligence was really measured by the army tests and was truly a factor in army success.

Having redefined central aspects of Yerkes's initial plan for the examining program, and with the aid of a $2,500 grant, a second set of trials of Army *a* was carried out on approximately 4,000 individuals in four military institutions during July and August 1917.[29] Responsibility for analyzing the results of this trial was given to a committee, the Statistical Unit, headed by Edward L. Thorndike, the eminent psychologist and tester at Teachers College, Columbia. The brunt of the work for Thorndike and his associates Arthur S. Otis and L. L. Thurstone lay in analyzing the results of the trial in order to judge and improve Army *a*'s validity as an instrument measuring intelligence.[30] Three sets of calculations were performed: a rough correlation of group results on Army *a* with expectations about the intelligence of the various groups tested, correlations of each of the tests and the scale as a whole with officers' ratings of examinee intelligence, and intercorrelations of each of the ten tests with the other tests in the scale. In one respect this procedure differed markedly from the validation methods previously used in Vineland.

When the Vineland group assessed *a*'s validity after the first set of trials, it relied on correlation with a known psychological instrument, the Binet scales, as the primary validation criterion. Finding that the correlations "were high [about 0.8] with outside measures of known value," the committee concluded that *a* was a satisfactory instrument for measuring intelligence. The Statistical Unit did otherwise. Operationalizing Yerkes's conclusion, in "Plan for Psychological Military Service," that intelligence rankings must be correlated with some measure of military success, Thorndike's unit divided the test population into three groups—adult defectives, enlisted men, and students in officer training camps—and determined how each had performed on the test. By confirming that adult defectives received low scores and enlisted men average scores, while students in officer training camps achieved superior scores, and that scores on *a* correlated at a moderately high level (about 0.5) with officers' evaluations of their recruits, Thorndike and his associates felt that they had established the validity of Army *a*. It was an instrument able to prophesy reasonably well, as Thorndike put it, "the mental ability which a man will display in the Army."[31]

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[29] The institutions were the Brooklyn Navy Yard, Fort Benjamin Harrison in Indianapolis, the Regular Army Reorganization Camp in Syracuse, and the National Guard Camp in Nashville. For more information see Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 313.

[30] The other major task of the Statistical Unit was to determine for each of the tests composing *a* a weight reflecting the contribution that test should make to the overall score. Thorndike pursued this assignment even before most of the data had been compiled. Using, as he claimed, "(1) the combined opinions of a dozen psychologists as to the relative weights to be attached to the tests; (2) a rough estimate of the variabilities of the tests; and (3) a rough estimate of their inter-correlations"—in other words, typical civilian criteria—Thorndike assigned weights ranging from 1 to 3 to each of the ten tests. See Yerkes, ed., *Psychological Examining*, p. 314.

In the process, however, the Statistical Unit continued to shift the focus of *a* away from civilian estimations of intelligence and toward explicitly military ones. As Thorndike argued in his statistical report to Yerkes: "The group test is to be used to prophesy the mental ability which a man will display in the Army. *Our best attainable measure of that is the rating for mental ability given to men by their company commanders.* If any one of the ten tests correlates zero with officers' ratings, it deserves zero weight in the composite score used for the prophecy. If it correlates highly it deserves much weight." For all the vehemence of Thorndike's language, and although he recommended some adjustments, Thorndike did not actually change any of the weightings he initially developed for Army *a*, concluding that "the tests all intercorrelate so closely that the revised weighting would not produce a much better result." Nonetheless, the Statistical Unit's very decision to validate Army *a* against officer evaluations and, especially, its willingness to alter the exam in order to increase *a*'s correlation with this measure, while reflecting in part Thorndike's particular beliefs about the nature of intelligence and how it should be assessed, indicate as well the importance accorded to the task of making Army *a* serviceable to the military.[32]

FROM ARMY *a* TO ARMY ALPHA

On 17 August 1917, after the second set of summer trials, Robert Yerkes was appointed a major in the Sanitary Corps of the Army Medical Corps, with the duty of organizing its new Psychological Division (see Figure 1). In many respects this event marked the beginning of the army's active engagement in the project of psychologically examining its recruits. Whereas before this point the contact between Yerkes's psychologists and the military, as we have seen, had been relatively informal and the psychologists had predicated their decisions as much on what they assumed as on what they knew the army wanted, by August Surgeon General Gorgas and members of the Office of the Chief of Staff and the Adjutant General's Office had begun to take a keen interest in the examining program and what it might or might not be able to accomplish.

Yerkes helped to initiate the serious involvement of the army by submitting to the surgeon general and the secretary of war a plan for an official army trial of the testing program he and his fellow psychologists had been developing unofficially during the preceding months. In explaining the program to Chief of Staff Peyton C. March, Surgeon General Gorgas emphasized two features: its ability to detect mental de-

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[31] *Ibid.*, pp. 305, 316. The correlations, in rank order, were task #5–information: .54; #6–synonyms/antonyms: .51; #3–disarranged sentences: .48; #1–oral directions and #10–number comparison: .47; #4–arithmetical problems: .46; #8–number series completion: .42; #9–analogies: .36; and #2–memory span: .34 (*ibid.*, pp. 315–316).

[32] *Ibid.*, pp. 316 (emphasis added), 317. Von Mayrhauser discusses many of the same issues in "The Practical Language of American Intellect" (cit. n. 1), though I disagree with his interpretation in a number of essential ways. His argument that the army testing program evolved from a pure to an applied endeavor is based on the positing of a distinction between the pure psychology of Yerkes and the applied psychology of Thorndike that is inconsistent not only with the details of Yerkes's attempt to adapt testing to the needs of the army but with Yerkes's own understanding of the nature of a mental test. As Yerkes points out in "The Binet versus the Point Scale Method" (cit. n. 17), both the Binet and his own point scale "are technological tools which have been devised to satisfy certain practical demands" (p. 112).

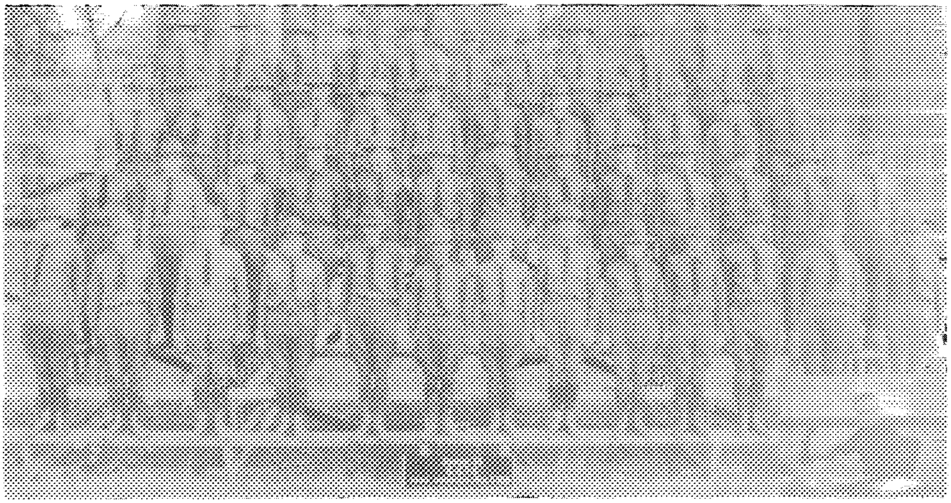

Figure 1. First company of commissioned psychologists, School for Military Psychology, Camp Greenleaf. Robert Yerkes is shown in the inset. (From Robert M. Yerkes, ed., Psychological Examining in the United States Army *[Memoirs of the National Academy of Sciences, 15] [Washington, D.C.: Government Printing Office, 1921], part 1, plate 1.)*

fectives, and the fact that its "results correlate highly with officers' judgments of their men and justify the further and official trial of the new psychological examining."[33] Quickly approved, Yerkes's plan called for the administration of Army *a* and an assortment of other measuring instruments to incoming recruits in four major Army cantonments: Forts Devens, Dix, Lee, and Taylor.

Running from September through December, this third trial involved the examination of over 65,000 soldiers under "real" military conditions, the same ones that would obtain were the testing program to be adopted army-wide (see Figure 2). Even before this trial had been completed and the data used to revise Army *a* once again, Yerkes and his fellow army psychologists began to receive feedback on military reactions to the practical value of their scientific expertise. At first the news was not encouraging. Reports from camp psychological examiners indicated indifference or downright hostility to their endeavors among many members of the officer corps, and in two of the camps there were lengthy delays before psychological examining could commence. Thus there must have been an enormous sense of relief when the first official assessments came in. Major General Adelbert Cronkhite, Commanding General of the 80th Division, Camp Lee, set the tone in his memo of 10 November 1917 to the adjutant general. Extolling the virtues of the examining program, General Cronkhite noted that "the results of the psychological examinations are fully borne out by actual observation of the abilities and the capacity of various officers in the duties assigned to them. I do not mean by this that these tests are an absolute gauge, but I do mean that they are an absolute guide." Subsequent reports by Colonel Henry A. Shaw of the Medical Corps, Brigadier General H. B. Birmingham of the Surgeon General's Office, and Colonel John J. Bradley of the War College Division of the

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[33] Surgeon General of the Army, memo to Chief of Staff, 21 Aug. 1917, in Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 12.

Figure 2. Scoring Group Examination a, *Camp Lee, October 1917. (From Robert M. Yerkes, ed.,* Psychological Examining in the United States Army *[Memoirs of the National Academy of Sciences, 15] [Washington, D.C.: Government Printing Office, 1921], part 1, plate 3, bottom.)*

Office of the Chief of Staff all seized on this point—the close correlation between test results and officer rankings—as *the* indicator of the value of the examining program. As Bradley put it: "This subject of psychology in its relation to military efficiency is an entirely new one and the War College Division approached it with a good deal of doubt as to its value. A very thorough study of the reports submitted, however, has firmly convinced it that this examination will be of great value in assisting and determining the possibilities of all newly drafted men and all candidates for officers' training camps." The reports to which Bradley refers were a survey of line officers asking whether they had found the test ratings to accord with their judgments and to repay the time it took to obtain them. Among these officers, support for the examining program was strong: 58 percent of respondents were favorable without qualification, 23 percent favorable with qualification, and only 19 percent in any way unfavorable.[34]

The army never wavered in the criteria it would use to judge the examining program. From Surgeon General Gorgas's justification of an official trial in August 1917 to the end of the war and beyond, two questions were consistently asked: Did the psychological ratings match those made by experienced officers? and Was it worth the time and effort to obtain those ratings? While the answers that army officials gave to these questions would vary considerably over the course of the next year, the value of the mental measuring techniques to the military was invariably judged against these standards. In this first set of assessments the answers to both questions were affirmative, and on 16 January 1918 psychological examining was officially extended to the entire army.

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[34] Major General A. Cronkhite, Commanding General, 80th Division, Camp Lee, memo to Adjutant General, 10 Nov. 1917, file 10716-29: Sanitary Corps—Medical Dept., box 561, RG 165: War College Division—General Correspondence, 1903–1919, National Archives, Washington, D.C. (hereafter cited as **WCD, 1903–1919**). For Henry A. Shaw (16 Nov. 1917) and H. B. Birmingham (7 Dec. 1917) see Yerkes, ed., *Psychological Examining*, pp. 19–24. John J. Bradley, Colonel, General Staff, for and in the absence of John F. Morrison, Major General, Director of Training, War College Division, memo to Chief of Staff, 24 Dec. 1917, file 10195-4: Classification and Selection of Personnel for U.S. Army, box 542, WCD, 1903–1919. For the survey of line officers see Lt. Walter V. Bingham, "Report of Company Commanders," file 10716-29: Sanitary Corps—Medical Dept., box 561, WCD, 1903–1919.

The program of intelligence testing that was adopted for army use was set out in a memo from Surgeon General Gorgas to Adjutant General John S. Johnston on 3 January 1918. This third plan codified the procedures that had been developed and the experience that had been gained during the trials of Army *a* and scaled them up for army-wide deployment. Materially, it called for a staff of 132 officers, 124 noncommissioned officers (NCOs), and 620 enlisted men to be distributed among 31 cantonments, the construction of buildings for psychological examining in each camp, and the establishment of a two-month training school for military psychologists at Fort Oglethorpe, Georgia, where military as well as psychological training would be emphasized. In terms of procedure, the plan mandated that all individuals receiving the lowest intelligence rating, E (very poor), should be individually examined and then, if still found mentally inferior, *recommended* for either discharge or assignment to a service battalion. And in terms of purpose, it proposed that every enlisted man and every newly appointed officer be tested, and it set out three goals for the examination: to identify the mentally inferior, to discover the mentally superior, and "to furnish approximate measurement of mental capacity which may be used in connection with the assignment of men to organizations to the end that companies and regiments within a given arm of the service may be of approximately equal strength mentally and therefore actively."[35]

This last goal for the testing program marked a decided break not only with standard military but also with standard psychological practice. The army had always had some mechanism for eliminating unwanted soldiers and for promoting those it found especially valuable. While psychological examining contributed to these functions, it in no way created them. Balancing companies according to intelligence was something different, however. No mechanism had ever existed in the military to accomplish this, and no kind of information, before intelligence testing, was available that would have differentiated to so fine a degree among the vast majority of enlisted men. But once a numerical evaluation scheme was put into place, these small differences became visible and magnified. The reports of the camp psychological examiners had noted the phenomenon early on in the official trial: great imbalances existed between companies vis-à-vis the mentality levels of their members.[36] This "imbalance" was noticed, however, not just by the camp psychologists but by company commanders as well, because they could now see the intelligence of each of their enlisted men expressed numerically and compare their group of recruits with those of other company commanders. This ability to use intelligence ratings to balance companies according to intelligence would, in the ensuing months, consistently be cited by officers as one of the principal values of the testing program.

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[35] Surgeon General Gorgas, memo to Adjutant General, 3 Jan. 1918, group 12, file 702 (2-7-22 to 6-25-18), box 1090, AGO, 1917–1925.

[36] See Yerkes, memo to Surgeon General, 20 Oct. 1917, Subject: Weekly Diary, folder 1751, box 91, Yerkes Papers.

If this use for psychological examinations was new to the military, it was also new for psychologists. Most civilian psychologists involved with mental testing worked primarily with either the mentally very inferior or very superior. Attention had just begun to be focused on the great center of the intelligence spectrum when the war broke out, and there was as yet little sense as to what intelligence differences among the middle group really meant. Thus while the decision to use intelligence rankings as an aid to balancing companies represents, on the one hand, an adaptation by the army to the authority of the new knowledge allowed within its midst, it also represents an adaptation by psychologists to the possibilities and demands of the military context. The military convinced psychologists, at least as much as psychologists convinced the military, to take notice of average intelligence and to accord it significance.

With the decision to extend psychological examining to the entire army, the next task before the Psychological Division was to analyze the data generated from the final trial of the examining program. Yerkes assigned the duty of evaluating the material relevant to Army *a* to a committee headed by Captain Clarence S. Yoakum, late of the University of Texas and currently serving in the army's Psychological Division; the members included Carl C. Brigham, Margaret V. Cobb, E. S. Jones, Lewis M. Terman, and Guy M. Whipple. Their mandate was to use the results from the full-scale trial to produce a thorough revision of Army *a*, one that would correct the various defects that had become apparent as the trial proceeded.[37]

To achieve this goal, Yoakum's committee assessed each of the tests of which *a* was composed, both on its own terms and to determine its contribution to the validity of the scale as a whole. The committee performed a number of separate measures of validity, giving most weight to the four employed in one or both of the earlier validations: correlation of each test with expectations of group performance, total test score, officers' ratings, and Binet score.[38] In the main, the committee's statistical findings were similar to those arrived at during the prior validations.[39]

Nonetheless, the test that Yoakum and his committee produced as a result of these statistics, Army Alpha, differed significantly from the revisions of *a* proposed previously, especially those advanced by Thorndike's Statistical Unit. Whereas Thorndike and his group had suggested changes in Army *a* that, as we have seen, were intended to increase correlation with officers' ratings, the major changes proposed by Yoakum's committee—the elimination of tests #2–memory span and #10–number comparison, the increase in the weight of test #6–synonyms/antonyms, and the addition of harder items to most of the remaining tests—were occasioned by a much different agenda: the desire to increase Alpha's correlation with Binet score and to reorient Alpha toward differentiating best at the higher end of the intelligence scale.

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[37] Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 327.

[38] The other analyses undertaken were the determination of the proportion of zero and perfect scores, correlations with age, correlations with schooling and with teachers' estimates, correlations with other ratings and tests, determination of the degree to which speed was a factor in the test results (speededness), and investigations into methods of scoring and weighting.

[39] Yoakum and his associates determined that Army *a* clearly stratified the examinees who participated in the trial into the expected intelligence hierarchy—officers on top, followed by officer training camp students, sergeants, corporals, enlisted men, and the feebleminded. Their analyses of the correlations of each test with total score, of the intercorrelations of each test, and of the correlations of each test with officers' ratings also all produced results that in most respects were similar to Thorndike's. Although there were some differences with the Vineland data over correlation with the Stanford-Binet, even these discrepancies were not tremendously significant, as both analyses picked the same five tests as best and the same three as worst. See Yerkes, ed., *Psychological Examining* (cit. n. 9), pp. 328–330, 338, 540–541.

Three factors stand out as crucial to explaining why Yoakum's committee developed such a different vision for Army Alpha. First, the leaders of each evaluation group viewed the nature of intelligence differently. Thorndike had long believed in the composite, heterogeneous character of intelligence, and thus he argued that each context demanded its own measure of mental ability.[40] On the other hand, Lewis Terman, who was undoubtedly the most influential member of Yoakum's committee, like Yerkes conceived of intelligence as a single entity that differed in degree but not in kind in its distribution throughout the population, similar to Charles Spearman's famous concept of "g."[41] Thus for Terman and Yerkes it was critical to correlate Alpha with an established measure of intelligence in order to ensure Alpha's validity.

Second, differences between Army Alpha and Thorndike's version of Army *a* can be traced to changes in the goals for the testing program itself. The insertion by Walter Dill Scott of "intelligence" into the set of criteria by which all army personnel were to be evaluated, and the military's desperate need to select appropriate NCO and officer training school candidates, meant that methods for categorizing all recruits, especially the more able, and assigning them appropriately were of high priority.[42] Yoakum and his committee responded to this need by changing the character of the test, transforming it from a general measure that discriminated equally well at all levels of intelligence, as understood by Thorndike, to one that worked best at the upper ranges, where the distinction between officers and enlisted men was thought to reside.[43]

Finally, differences between Army Alpha and Army *a* arose because Yoakum's group, although it too acknowledged the importance of officers' ratings and stratification by rank in the development of Alpha, focused principally on the adequacy of the new instrument according to the standards of professional psychology. Yerkes revealed his own ambivalence toward military notions of intelligence in a letter to Thorndike dated 2 April 1918: "Best thanks for your letter of March 18th relative to correlation of Army intelligence measurements to intelligence ratings given by officers. I am surprised that the correlation is so high, for in my opinion the officers' ratings are often based upon very peculiar conceptions of what is meant by intelligence." Rather, what Yerkes valued, as he put it succinctly in a letter to Lewis Terman, were *psychological* measures of intelligence: "Examination *a* is really a remarkable creation of *psychological* intelligence."[44] It was "psychological intelligence" that Yerkes wanted, and it was psychological intelligence that Terman and Yoakum gave him when they made correlation with Stanford-Binet score the principal criterion for judging the performance of Army Alpha. The Stanford-Binet was *the* measuring rod for intelligence within civilian psychology. Employing it as a validation device ensured that Army Alpha would seem legitimate in the eyes of civilian psychologists.

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[40] For the most complete statement of Thorndike's mature views on the nature of intelligence see Edward L. Thorndike, E. O. Bregman, M. V. Cobb, and Ella Woodyard, *The Measurement of Intelligence* (New York: Teachers College, [1926]). In addition see Geraldine J. Clifford, *Edward L. Thorndike: The Sane Positivist* (Middletown, Conn.: Wesleyan Univ. Press, 1984), Chs. 14–17 and esp. pp. 368–370; Edward L. Thorndike, *Educational Psychology* (New York: Lemcke & Buechner, 1903); Thorndike, *Education, a First Book* (New York: Macmillan, 1912), esp. pp. 102–116; Thorndike, *Individuality* (Boston: Houghton Mifflin, 1911); and Thorndike, *Educational Psychology*, Vols. 1–3 (New York: Teachers College, 1913–1914).

[41] It is important to note, however, that the differences between Thorndike and Terman were not absolute. While Thorndike always stressed in his public writings the heterogeneous nature of intelligence, he did not hesitate to construct measuring instruments that, like Terman's, assigned a single number to an individual's intelligence. And while Terman remained committed throughout his career to a concept of general or global intelligence like Spearman's famous "g," he continued to construct tests in which a number of different tasks were used to measure intelligence, although only a few, at most, should have been considered necessary to get a good measure of "g." See Chapman, *Schools as Sorters* (cit. n. 12); Minton, *Lewis M. Terman* (cit. n. 12), esp. pp. 46–51; Lewis M. Terman, *The Measurement of Intelligence* (Boston: Houghton Mifflin, 1916), esp. pp. 42–46; and Terman, "Intelligence and Its Measurement: A Symposium," *Journal of Educational Psychology*, 1921, *12*:127–133.

[42] Although the actions of Scott and Yerkes tended in many ways to reinforce one another, there was little love lost between them. Scott had parted ways with Yerkes and his approach to aiding the military at the very start of the endeavor, in April 1917, and pursued his own agenda based on his experience in civilian business psychology. Von Mayrhauser has discussed the split between Scott and Yerkes thoroughly in "The Manager, the Medic, and the Mediator" (cit. n. 1).

[43] As Thorndike noted to Yerkes on 18 July 1917: "I do not wish to push any tests for officers until Scott's scale is adopted or rejected. Also I do not think there is any demand from the army for tests of intellect of officers beyond what they have already by college selection and their own exams." Thorndike to Yerkes, 18 July 1917, file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—July 1917, NRC Papers.

The stress placed by Yoakum's committee on the norms of civilian psychology did not mean, however, that it was impervious to the influences of the testing program's military context. Indeed, Yoakum's appointment as head of the committee was explained on the basis of "his intimate acquaintance with the conditions and results of examining in the camps." In addition, Yerkes justified the revisions of Army *a* to the surgeon general not in terms of better measurement, but as a means of saving paper and time.[45] What Yoakum's actions do indicate, however, is that the military was not the only influence. The psychologists building the various versions of Army *a* and Army Alpha were subjected to two sets of pressures. On the one hand, they all knew that their primary consumer was the United States Army and that the tests would never be adopted if they did not seem appropriate to the needs of that organization. On the other hand, all of these testers were members of the community of professional psychologists and thus expected to follow the dictates and practices that gave that community its definition. While these two audiences were not necessarily in conflict, the practical realities of designing and implementing a new testing program meant that tensions and thus the need for accommodation constantly arose. Different groups of psychologists, as we have seen, resolved them in different ways, but neither Thorndike's group nor Yoakum's was able to escape entirely the constraints of having to meet the demands of dual audiences.

ARMY ALPHA: BETWEEN PSYCHOLOGY AND THE MILITARY

The revision of Army *a* into Army Alpha took Yoakum's committee most of the month of January 1918. For the next three months psychological examining continued, most probably with Army *a*, at the relatively slow pace of about 14,000 recruits per month while new forms were getting printed, psychological examiners were being trained, and bureaucratic wars were being fought. The nominal cause of the skirmishing was the Psychological Division's request—in keeping with the surgeon general's memo of 3 January—for additional personnel and the construction of examining buildings in each camp.[46] The request was denied by the adjutant general and the Office of the Chief of Staff in February, and a flurry of memos ensued; the outcome was a memo instructing camp commanders to make some existing building available for psychological examining and ordering the surgeon general to delay commissioning additional psychologists.[47] The significance of these battles—over rather petty issues—lay in their symbolism: the continued ambivalence, outside of the Surgeon General's Office, about the mental testing of army troops. The shakiness of the support for psychological testing came to the fore just at the moment of Yerkes's greatest military triumph.

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[44] Yerkes to Thorndike, 2 Apr. 1918, file: Surgeon General's Office: Division of Psychology: Psychological Examination of Recruits: General, 1918; Agencies and Departments: War, NRC Papers; and Yerkes to Lewis M. Terman, 6 Nov. 1917 (emphasis added), file: Committee on Psychology: Subcommittee on Methods for Psychological Examination of Recruits, 1917; Executive Committee, NRC Papers.

[45] Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 327 (quotation); and Yerkes, memo to Surgeon General, Subject: Weekly Diary, 26 Jan. 1918, pp. 25–26, folder 1751, box 91, Yerkes Papers.

On 28 April 1918 the psychological examining of enlisted men, officer training candidates, and line officers began in earnest. The new test forms—Alpha for literates and Beta for illiterates—were introduced, and testing jumped to a rate of over 200,000 per month, a level that would continue almost until the end of the war. At the same time that the army was manifesting this enormous support for intelligence testing, members of the Chief of Staff's Office began to worry about the value of the entire endeavor. Spurred on, in all probability, by a highly negative report on army testing submitted by Lieutenant Colonel Lear of the War Plans Division, three full-scale investigations of the military value of the examining program were launched in May. The first, conducted by the Adjutant General's Office, involved directly surveying commanding officers to ascertain what benefits they had derived from the psychological work and whether they thought it should be continued. Between 90 and 100 responses were received, most fairly skeptical about the value of the testing program.[48]

The second and third studies—one initiated by Assistant Secretary of War Benedict Crowell on 10 May and carried out by Goldthwaite H. Dorr, and the other ordered by Chief of Staff Peyton March on 20 May and performed by Colonel R. J. Burt of the General Staff—mandated personal observation of the examining program and interviews with those who had been dismissed because of it. Dorr's report was issued on 10 June 1918. While generally negative, Dorr did not recommend eliminating the testing program but, rather, its transfer to the Committee on Classification of Personnel, its revision with input from senior officers, and its use as an *aid* in the placement of recruits. Burt's report, delivered on 18 June, was more favorable. Although he too recommended certain revisions in the examining program, most especially the testing of officers only at the request of their commanders, Burt strongly supported the continued examining of all recruits and an increase in Psychological Division personnel.[49]

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[46] Yerkes, memo to Camp Division Surgeons, 24 Jan. 1918, in Yerkes, ed., *Psychological Examining*, p. 58. For monthly data on the number of psychological examinations given see *ibid.*, p. 100.

[47] See Brigadier General Henry Jervey, Asst. Chief of Staff, memo to Adjutant General, 18 Feb. 1918, group 2; and Jervey to Acting Secretary of War, 6 Apr. 1918, group 5; both in file: Psychological Tests, box 148, #1150, RG 165: Office of the Chief of Staff—Correspondence, 1918–1921, National Archives, Washington, D.C. (hereafter cited as **OCS, 1918–1921**).

[48] See recommendation that an investigation be undertaken of the value of the army testing program in Lytle Brown, Brigadier General, War Plans Division, memo to Chief of Staff, 6 May 1918, file 10716-5: Sanitary Corps—Medical Dept., box 561, WCD, 1903–1919. See letter sent to all Commanding Officers by the Adjutant General, quoted in Yerkes, memo to Chief of Staff, 12 Sept. 1918, in Yerkes, ed., *Psychological Examining* (cit. n. 9), p. 43. A large number of the responses are collected in group 1, file 322.3 (7-10-18 to 1-4-18), box 698, AGO, 1917–1925.

What is most striking about these two reports, however, is not their differences but their similarities. These studies constituted the first extensive investigations of military psychology by individuals outside the Surgeon General's Office, and the degree to which Dorr and Burt concurred in their findings is notable. Both reported the same three objectives for psychological examining, those articulated by Gorgas in his memo of 3 January: eliminating the unfit, identifying the superior, and balancing units with regard to intelligence. Both emphasized that test results should be used solely as an aid in determining the examinee's fate, that intelligence is only one of a number of qualities important to the making of a good soldier, and that the testing program needed close military supervision (though Dorr lauded the military training received by the examiners as contributing to the military feel of the process). And both noted that, in general, officers found a high correspondence between their own evaluations of their men and the results generated by the psychological examinations.

This last point was most crucial. Dorr admitted it rather grudgingly:

> The closer observation I made of the working of all of the psychologic tests, the more impatient I became with their failure through their mechanical character to accurately gauge in certain instances the actual workings of the mind of the man being examined. . . . Nevertheless, I have concluded that in such close observation the defects of this system are unduly magnified and the substantial accuracy of the average result lost sight of. *I have reached this conclusion because of the great weight of testimony of officers who have compared the results of the tests with their own observations of the men tested that there is a striking correspondence in the results of the tests and their own observation as to the mental alertness and agility of the men examined.*

Dorr was not alone in the military in worrying about the mechanical nature of the examinations and their failures in specific instances to gauge accurately the military value of a soldier. Such fears were widespread, had appeared almost as soon as the testing program was tried out, and would persist as long as the program was in operation. Statistical thinking and mechanical sorting on any criterion violated the tradition of personal evaluation by one's superiors and had had as little place in the military world as in the civilian. Nonetheless, Dorr supported the continuation of psychological examining in the army, persuaded by two related factors. Given an army where "large groups of green men are put into the hands of Company officers, themselves of limited experience," testing seemed to have a practical function.[50] And neither Dorr nor any other military official could ignore the support for examining among company commanders. As long as test results matched officer evaluations, the examinations could not be easily dismissed.

On the military side, the upshot of these three investigations was to maintain the army's ambivalent support for psychological testing. Reports issued by Third Assistant Secretary of War Frederick Keppel, by War Planning Division Chief Lytle Brown, and by Assistant Chief of Staff Henry Jervey all recommended the continuation of the examining process in some form, though they contradicted each other on specifics.[51] General Orders No. 74, issued on 14 August 1918, should have settled the issue once and for all. This order was apparently a victory for the critics of psychological examining, for—while finally officially establishing the Psychological Division—it sharply limited the scope of the testing program by making all examining optional (i.e., at the discretion of the commanding officer) and eliminating the individual examination. It also reduced the roles for army testing to one: helping company commanders balance their units mentally. Nonetheless, in the same month a record 300,000 soldiers were tested, with little diminution in the following month, and in November Brown and Jervey would collaborate on Circular No. 65, urging that *all* enlisted men and officers have their intelligence ratings recorded on their qualification cards.[52]

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[49] See G. H. Dorr, memo to Assistant Secretary of War, 10 June 1918, file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925; and Col. R. J. Burt, memo to Chief of Staff, 18 June 1918, file 10195-25: Classification and Selection of Personnel for U.S. Army, box 542, WCD, 1903–1919.

[50] See Dorr, memo to Assistant Secretary of War, 10 June 1918, pp. 11 (emphasis Dorr's), 13.

If the military's response to the examination program was fraught with indecision and doubt, the same cannot be said of psychology's response to these military uncertainties. Still unshaken in his belief that the army could be convinced of the value of psychological testing, Yerkes resolved to redouble his efforts at persuasion, and to do so along two lines. As he put it explicitly in his *War Diary* for 25 June 1918, "We should be able to make it [psychological examining] more intensely practical and more directly military in appearance." The interest in appearing military had manifested itself early in the history of the testing program. The directions developed for the administration of the army intelligence examinations, for example, were given in commands—"Attention!" "Go!" "Stop!"—with a premium placed on absolute obedience—"Now, in the Army a man often has to listen to commands and then carry them out exactly. I am going to give *you* some commands to see how well you can carry them out. Listen closely. Ask no questions. Do not watch any other man to see what *he* does."[53] Contrast these instructions with those for some of the tests at the adult level of the civilian Stanford-Binet: "I want to find out how many words you know. Listen, and when I say a word you tell me what it means" or "You see this box; it has two smaller boxes inside of it, and each one of the smaller boxes contains a little tiny box. How many boxes are there altogether, counting the big one?" In addition, Yerkes and his fellow army psychologists actually took army commissions, and most received extensive military training at Fort Oglethorpe.[54]

After the less-than-enthusiastic reviews of the army testing program in June, Yerkes used almost every opportunity to exhort his psychological examiners to increase the military appearance of their endeavors. He also had the ratings assigned to each

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[51] See Frederick P. Keppel, memo to Secretary of War, 24 May 1918, group 12, file 702—Psychological (2-7-22 to 6-25-18), box 1090, AGO, 1917–1925; and Brigadier General Lytle Brown, memo to Chief of Staff, 25 July 1918, group 13; and Brigadier General Henry Jervey, memo to Chief of Staff, 29 July 1918, group 15; both in file: Psychological Tests, box 148, #1150, OCS, 1918–1921.

[52] See General Orders No. 74, 14 Aug. 1918, file 10716-29: Sanitary Corps—Medical Dept., box 561, WCD, 1903–1919. On the other hand see Brown, memo to Chief of Staff, 31 Oct. 1918; and Jervey, memo to Adjutant General, 6 Nov. 1918; both in file: 10195-40: Classification and Selection of Personnel for U.S. Army, box 542, WCD, 1903–1919.

[53] Robert M. Yerkes, *War Diary*, p. 119, folder 2663, box 171, Yerkes Papers. For copies of all of the army tests, including their directions and scoring instructions, see Yerkes, ed., *Psychological Examining* (cit. n. 9), pp. 123–195. The examples in the text are taken from the Alpha test, p. 157.

[54] The examples from the Stanford-Binet come from Terman, *Measurement of Intelligence* (cit. n. 41), pp. 224, 327. Concerning the military commissions, Yerkes explained in a letter to Surgeon General Gorgas in July, "It is important, if these kinds of work are to be continued and rendered substantially useful to the Government, that they be henceforth directed by a military officer": Yerkes to Gorgas, 23 July 1917, file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—July 1917, NRC Papers.

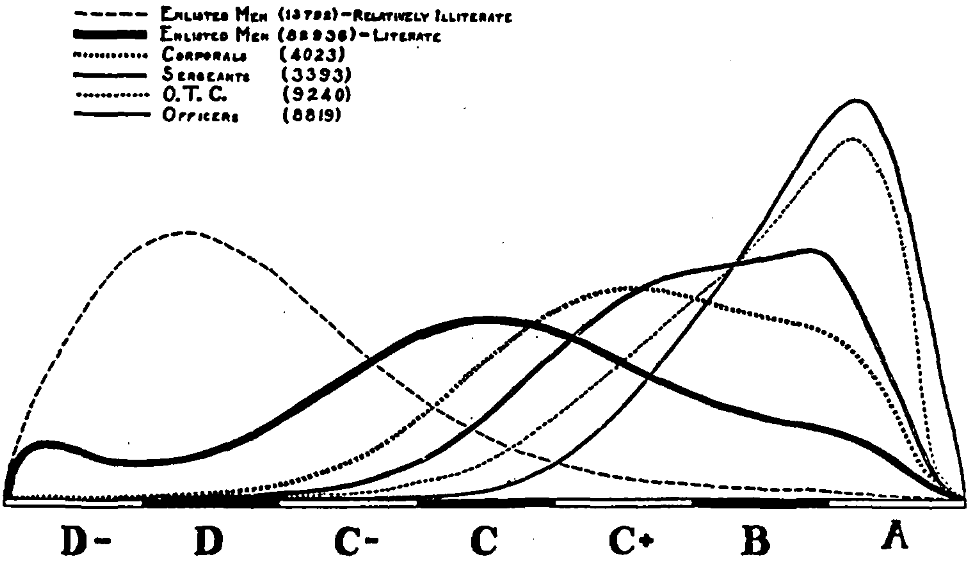

Figure 3. The distribution of intelligence ratings in typical army groups, showing the value of the tests in the identification of officer material. The illiterate group was given Beta; other groups were given Alpha. Yerkes wrote: "The psychological ratings have proved valuable not so much because they make a better classification than would come about in the course of time through natural selection but chiefly because they greatly abbreviate this process by indicating immediately the groups in which suitable officer material will be found, and at the same time those men whose mental inferiority warrants their elimination from regular units in order to prevent the retardation of training. Speed counts in a war that costs fifty million dollars per day." (From Robert M. Yerkes, Army Mental Tests: Methods, Typical Results, and Practical Application *[Washington, D.C.: Government Printing Office, 22 Nov. 1918]; copy in Yerkes Papers.)*

examinee—A, B, C+, C, C−, D, D−, or E—as the end result of the testing process revised in August so that they were explained specifically in military terms (see Figure 3): "*What the grades mean. . . . B. Superior intelligence.*—Commissioned officer type and splendid sergeant material. . . . *C. Average intelligence.*—Good private type, with some fair to good N.C.O. material. . . . *D−. Very inferior intelligence,* but considered fit for regular service."[55] Imbued with military language, devised by military psychologists, and administered by military men in a military setting, the mental tests that Yerkes and his committee created were structured to seem less like foreign objects imposed by ivory-tower academics, and more like familiar techniques and practices developed by army personnel.

Yerkes did not work himself and admonish his examiners to make the examinations simply more military in appearance, but more practical as well. Continuing the theme of serviceability that he had learned to emphasize early in his dealings with the army, Yerkes repeatedly sought ways to constrain those features that members of the General Staff found most objectionable and to increase the efficiency of the examining procedures. Thus, in response to persistent worries that intelligence testing was being manipulated by malingerers, the Psychology Division decided to narrow the range on its lowest score category, level E, so that the number of recruits recommended for discharge would be reduced; testers also stressed that the most important function of army testing was to indicate the "type of service for which each man or group is fitted." Yerkes forcefully reminded camp psychologists in August that one of their primary duties was to persuade their camp commanders that the army tests had practical value: "practical service is the only justification for the continuation of psychological examining or any other kind of psychological work in the army. . . . Indeed, a most important single word of advice from this office is—demonstrate your usefulness to the officers of your camp and thus command their interest and cooperation." If the response of George F. Arps, Chief Psychological Examiner at Camp Sherman, is any indication, the psychologists in the field often strove mightily to carry out this assignment. "Re the memo," Arps wrote Yerkes, "I trust you will bear in mind that all scientific niceties were thrown overboard and that I have in this, as in most matters, taken an entirely practical attitude. The Div. Surgeon remarked that it 'cut the critics from under.'"[56]

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[55] Yerkes, ed., *Psychological Examining,* p. 424.

THE ARMY'S RESPONSE TO ALPHA

"Cutting the critics from under" was certainly Yerkes's goal. Whether by giving the examining program a more military appearance, by altering the instruments to make their operation more efficient and their results more palatable, or by actively "selling" psychological methods, members of the Psychological Division worked diligently to persuade the army of the value of their endeavors.[57] The results of this process of accommodation, however, were not, as we have seen, an easy assimilation of mental testing by the military. While Yerkes was able to convince the army's top echelon to institute the testing program, his success in demonstrating to rank-and-file officers and to the high command their continued need for such a program was much more equivocal. In part, Yerkes's problems derived from the very organization of the army. In the existing military institutions with which Yerkes had to deal he confronted a structure that either had had no history of interest in the techniques he could provide or that had already developed other methods associated with other groups of professionals, most notably army doctors and neuropsychiatrists, who were little disposed to cede their territory to a rival professional group.[58]

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[56] Yerkes, memo to all Camp Psychological Examiners, 12 Nov. 1918, file: War: SGO: Division of Psychology: Psychological Examination Results: Reports: Monthly—1918, Agencies and Departments, NRC Papers; "*Division of Psychology*, Third Monthly Report, August 1918," 3 Sept. 1918, folder 1755, p. 175, box 92, Yerkes Papers; and George F. Arps to Yerkes, 27 Aug. 1918, folder 1751, pp. 17–22, box 92, Yerkes Papers.

[57] One example of Yerkes's efforts to sell the military on the value of psychological testing occurred after Secretary of War Newton Baker remarked in a public address that he was "rather afraid to take a Binet test." Yerkes wrote to Baker with the suggestion "that I be permitted to arrange, sometime at your convenience and command, a demonstration of our methods of mental examining in the army and of our results, for yourself and such members of the administrative family and War Department as you desire to ask. It would, of course, be splendid to have President Wilson acquainted with our work, but it seems to me especially important that the Secretary of War and his Chief of Staff, who have ordered millions of their fellow men to take these tests, should have reliable first hand knowledge of them": Yerkes to Baker, 4 Sept. 1918, folder 1760, box 92, Yerkes Papers.

[58] For a rich collection of reactions to the intelligence testing program see file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925; and file 10716-29: Sanitary Corps—Medical Dept., box 561, WCD, 1903–1919. For the details of an early meeting between Yerkes and members of the psychiatric community in which the issue of territorial encroachment was discussed at length see "Report of Dr. Yerkes," [30 May 1917 (date penciled in)], file: APA: Committee on Psychological Examination of Recruits; Institutions, Associations, Individuals—April 1917, NRC Papers.

Thus Yerkes was never in a position to demand that his tests be accorded sole control over the elimination of the unfit, the selection of officer candidates, or any of the other functions for which they were designed; instead, he had to settle for Army Alpha and Army Beta being conceded, at best, an advisory role in determining the fates of the individuals tested.

In addition, and more importantly, the ambivalent reaction to the army testing program can be traced to the range of responses it elicited from members of the officer corps. Many, as we have seen, were persuaded rapidly. Citing, almost invariably, the close correlation they found between the test results and their own evaluations of subordinates, these officers tended to praise the accuracy and expeditiousness of the tests and to argue that Army Alpha would prove especially helpful in dealing with large numbers of unknown recruits needing rapid training and placement. As Captain Norbarue Berkeley, commander of Battery "E" of the 313th Field Artillery, put it:

> I am of the opinion that an intelligence rating of the men is of great value. The rating given the men of this Battery coincides remarkably well with the rating of the men by the Officers of this Battery after a study of the men for two months. . . . The report of the psychological examination has been used and much weight given to it in recommending men for the third Officers Training camp, recommending men for appointment as non-commissioned officers and in sorting out the poorest men in the Battery for special instructions and drill.[59]

Other officers, though initially more skeptical, were often eventually won over if more lengthy acquaintance with the testers assigned to their units and firsthand experience with the tests convinced them that the test results could serve as an aid to personnel evaluation without disrupting either the functioning of the unit or their own command prerogatives.[60]

Nonetheless, there were a number of officers, and they ranged from major generals down to first lieutenants, who were much less sympathetic to the army tests. Generally, they advanced one, or some combination, of three reasons. First, many believed that intelligence tests were not necessary, that there existed sufficient opportunities to observe one's subordinates during the early days of training camp for time-honored military methods of evaluation and placement to be practical. Second, a number of officers argued that the army examinations simply did not measure "intelligence." "This test," as one colonel reported, "is considered more a test of a man's familiarity with general information taking the nature of current topics, etc. rather than a measure of intelligence (see Figure 4). A Newspaper reporter would most probably attain a higher grade than a civil engineer."[61] Numerous other officers

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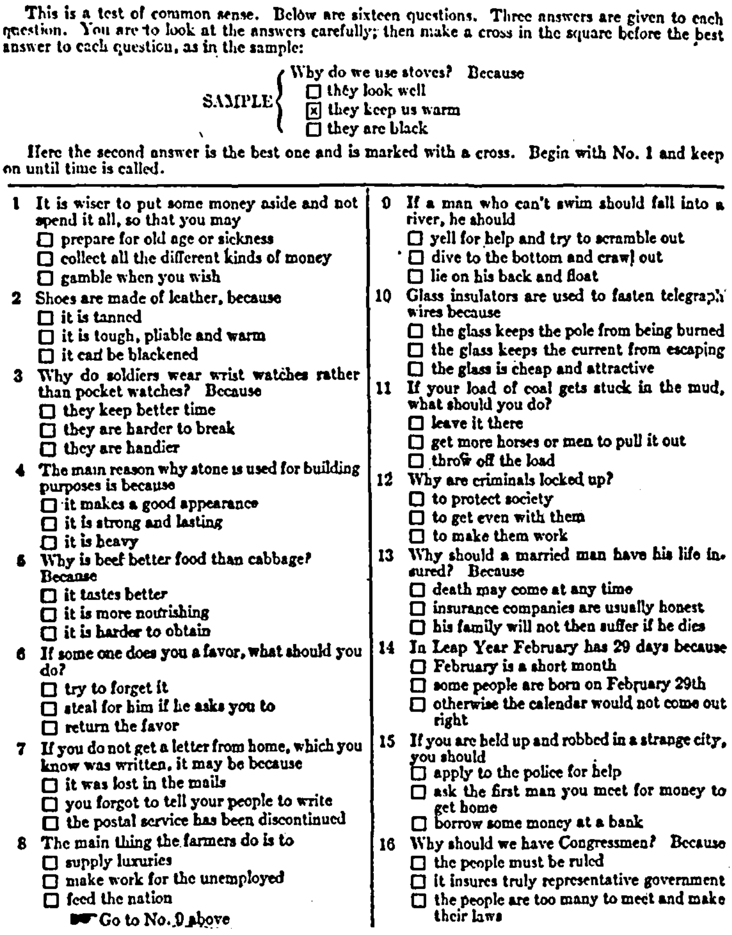
[59] Captain Norbarue Berkeley, Commanding Officer, Battery "E," 313th Field Artillery, Camp Lee, memo to Regimental Adjutant, 13 Dec. 1917, Exhibit F: Camp Lee Questionnaire Responses, file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925. Testimony by other officers can also be found in this file.

[60] E.g., Goldthwaite Dorr reported to the War Department that General Cronkhite "expressed himself as at first having been very doubtful about the value of the [psychological testing] work," but "as a result of his experience [with the tests], General Cronkhite felt that the tests gave valuable information if properly used": Dorr, Office of the Assistant Secretary, War Department, memo on Psychological Tests, Camp Lee—General Adelbert Cronkhite, file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925.

[61] Colonel Robin S. Welsh, Commanding Officer, 314th Field Artillery, 155th Field Artillery Brigade, Camp Lee, memo to Chief Psychological Examiner, Camp Lee, 22 Dec. 1917, Exhibit F: Camp Lee Questionnaire Responses, file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925.



This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE
Why do we use stoves? Because
☐ they look well
☒ they keep us warm
☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 It is wiser to put some money aside and not spend it all, so that you may
☐ prepare for old age or sickness
☐ collect all the different kinds of money
☐ gamble when you wish

2 Shoes are made of leather, because
☐ it is tanned
☐ it is tough, pliable and warm
☐ it can be blackened

3 Why do soldiers wear wrist watches rather than pocket watches? Because
☐ they keep better time
☐ they are harder to break
☐ they are handier

4 The main reason why stone is used for building purposes is because
☐ it makes a good appearance
☐ it is strong and lasting
☐ it is heavy

5 Why is beef better food than cabbage? Because
☐ it tastes better
☐ it is more nourishing
☐ it is harder to obtain

6 If some one does you a favor, what should you do?
☐ try to forget it
☐ steal for him if he asks you to
☐ return the favor

7 If you do not get a letter from home, which you know was written, it may be because
☐ it was lost in the mails
☐ you forgot to tell your people to write
☐ the postal service has been discontinued

8 The main thing the farmers do is to
☐ supply luxuries
☐ make work for the unemployed
☐ feed the nation
☞ Go to No. 9 above

9 If a man who can't swim should fall into a river, he should
☐ yell for help and try to scramble out
☐ dive to the bottom and crawl out
☐ lie on his back and float

10 Glass insulators are used to fasten telegraph wires because
☐ the glass keeps the pole from being burned
☐ the glass keeps the current from escaping
☐ the glass is cheap and attractive

11 If your load of coal gets stuck in the mud, what should you do?
☐ leave it there
☐ get more horses or men to pull it out
☐ throw off the load

12 Why are criminals locked up?
☐ to protect society
☐ to get even with them
☐ to make them work

13 Why should a married man have his life insured? Because
☐ death may come at any time
☐ insurance companies are usually honest
☐ his family will not then suffer if he dies

14 In Leap Year February has 29 days because
☐ February is a short month
☐ some people are born on February 29th
☐ otherwise the calendar would not come out right

15 If you are held up and robbed in a strange city, you should
☐ apply to the police for help
☐ ask the first man you meet for money to get home
☐ borrow some money at a bank

16 Why should we have Congressmen? Because
☐ the people must be ruled
☐ it insures truly representative government
☐ the people are too many to meet and make their laws

Figure 4. Group Alpha Examination, Test 3: Practical Judgment (Form 8). (From Carl C. Brigham, A Study of American Intelligence *[Princeton, N.J.: Princeton Univ. Press, 1923], p. 13.)*

commented that the tests seemed to be designed more to measure speed and accuracy than higher mental powers and that they privileged school learning over real military experience.

Finally, a large number of officers hostile to the testing program, while conceding that the tests did indeed measure intelligence, argued that intelligence alone was not sufficient to make either a good officer or a good enlisted man. As the commanding officer of the 41st Company at Camp Lee graphically put it, "In selecting corporals and line sergeants the physical qualifications will ordinarily supersede the mental. The ability to handle men, the gift of making men follow is seldom shown on paper. The most intelligent clerk can not compete in the gentle art of murder with a two-handed athlete whose ambition does not rise above the rank of sergeant."[62] Other officers stressed the importance of bearing, demeanor, loyalty, willingness to follow orders, and especially character when describing the qualities they looked for in a soldier, be he officer or enlisted man.

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[62] First Lieutenant A. R. P.[?], Commanding Officer, 41st Company, 11th Training Battalion, 155th Depot Brigade, Camp Lee, memo to Commanding Officer, 11th Battalion, Depot Brigade, Camp Lee, 11 Dec. 1917, Exhibit F: Camp Lee Questionnaire Responses, file: 702—Psychological (7-31-18), box 1856, AGO, 1917–1925.

The effect of this deep division within the officer corps over the relevance of the test results to the practical needs of the military was to preclude effective implementation of the system Yerkes sought to establish. Although testing continued apace from May 1918 until the Armistice in November, by war's end no system had yet been established to ensure even that a soldier's intelligence ranking be included in his personnel file, much less that it be considered when determining what duties he ought to be assigned. Rather, Yerkes found himself constantly struggling to convince both company commanders and members of the higher echelons that his tests provided information pertinent to their immediate concerns.

Nonetheless, the army's intelligence testing program did have some important effects. As mentioned earlier, over 1.75 million men were tested, and the program was judged sufficiently valuable for it to be extended to all army training camps and to be maintained even in the face of at times heavy criticism. Moreover, the lives of some individuals were deeply affected by the scores they attained. Although psychological testing was rarely used as the sole determinant of an individual's fate, there is no question that some of the decisions reached by army discharge boards were the result of the over 7,700 recommendations for discharge and 28,000 for transfer forwarded to those boards on the basis of the army tests. In addition, although there was no official policy concerning the use of intelligence test results in the selection of NCO or officer training school candidates or in the creation of units balanced in terms of intelligence, it is clear from officer reports that many commanding officers relied on these results either to corroborate judgments already made or as a principal tool of selection. As Yerkes noted in a memo to the surgeon general, "Lieut. H. T. Moore, Camp Cody, reports that the Personnel Officer has assigned drafted men partly on the basis of psychological ratings, taking care to place an equal number of A, B, C, D, and E men in each organization."[63]

More significantly, at the level of *mentalité* a dramatic transformation occurred: "intelligence" became a characteristic of consequence in army culture. I have already mentioned one major indication of this shift: the growing tendency of officers to assess the intelligence of their subordinates when carrying out evaluations. The revision of the efficiency report form, along with Army Alpha and Army Beta, taught army officers to take cognizance of "intelligence," and by the end of the war many commanding officers became quite accustomed to seeing "intelligence" as a distinct and relevant characteristic of their men, of direct value to military needs. This is vividly exemplified by the technique, developed by various unit commanders during the war, known as the "passing cull." Intelligence ratings took on enough authority that, as Franz Samelson describes it, "unit commanders would hold onto soldiers with high intelligence ratings and try to pass along [to other companies] those with low ratings."[64]

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[63] See Yerkes, memo to Surgeon General, 5 July 1918, folder 1754, pp. 1–12, box 92, Yerkes Papers. Statistics on recommendations for discharge or transfer are drawn from *The Medical Department of the United States Army in the World War,* Vol. 1: *The Surgeon General's Office* (Washington, D.C.: Government Printing Office, 1923), p. 402. For further comment on the extent of the army's use of testing see Samelson, "Putting Psychology on the Map" (cit. n. 1), pp. 142–145.

[64] Samelson, "Putting Psychology on the Map," p. 145; see also U.S. Adjutant General's Office, *Personnel System* (cit. n. 9), Vol. 1, pp. 311–313.

A second indication of the new place of "intelligence" in the American military was the army's continued reliance on mental tests in the immediate postwar period. Not only were intelligence tests administered to new recruits for at least a year after the Armistice, but in 1919 the army commissioned a new set of tests specifically designed for illiterate and non-English-speaking recruits, and it also used intelligence scores in a large study of the relationship between low mentality and the criminal or nonmilitary behavior linked to breaches of discipline.[65]

But perhaps the most telling example of the increased authority accorded "intelligence" is provided by the revision of Special Regulations No. 65, dated 8 November 1918. The revised Special Regulations No. 65 stated that morons must be unconditionally rejected from the army and defined a moron as "an individual whose mental development is that of a child not over eight years of age, as measured by the Binet-Simon test." The decision to create a minimum standard of intelligence, and to do so in the language of psychology and through the use of psychological methods, represents an enormous transformation in the army way of thinking.[66] Before the war it would have been, almost literally, inconceivable for the army to have promulgated something like Special Regulations No. 65. It is not the elimination of morons, in and of itself, that would have been the problem, for the standard recruit medical examination had for some time acknowledged lack of sound understanding as cause for discharge.[67] But the creation of a precise, test-based standard, numerically defined, violated the long-standing tradition of personal evaluation based on the assessment of a multitude of subjective factors. Things changed over the course of the war. As the military began to understand and accept the new psychological knowledge it had allowed within its midst, and thus as the authority of that knowledge grew, it was the military that became transformed, and "intelligence" that pushed the transformation.[68]

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[65] On the new tests see group 31, file: Psychological Tests, box 148, #1150, OCS, 1918–1921. This resulted in the order of 3 Oct. 1919, establishing psychological examinations for illiterates, printed as *Recruit Psychological Examination for Illiterates and Non-English-Speaking Citizens and Aliens*, stamped 21 Nov. 1919, group 4, file 702 (2-7-22 to 6-25-18), box 1090, AGO, 1917–1925. For data on the relation of intelligence scores and criminal or nonmilitary behavior see group 44, file: Prisoners, box 145, #1150, OCS, 1918–1921.

[66] Special Regulations No. 65, "Physical Examination for Entrance into the Army by Voluntary Enlistment or by Induction under the Selective Service Law, 1918," was formally adopted as the second edition of Form 75, *Standards of Physical Examination for the Use of Local Boards, District Boards, and Medical Advisory Boards under the Selective-Service Regulations* (Washington, D.C.: Government Printing Office, 1918), issued by the Office of the Provost Marshall General in 1918. See pp. 37–38 for the addition of "moron" to the list of "disqualifying defects" and for its definition. The regulation was modified in June 1919 to apply to recruits with mental ages of ten years or less; for an explanation of the modification of regulations see Brigadier General Lytle Brown, Director of War Planning Division, memo to Chief of Staff, 13 June 1919, group 30, file: Psychological Tests, box 148, #1150, OCS, 1918–1921.

[67] E.g., the *Manual of Instructions for Medical Advisory Boards* (Jan. 1918 ed.) explicitly called for the rejection of "idiots" and "imbeciles" but defined these terms in qualitative language: "*Idiot.*—A registrant so deeply defective in mind from birth or from early age that he is unable to guard himself against common physical danger. *Imbecile.*—A registrant so deeply defective in mind from birth or from early age as to be incapable of earning a livelihood, but able to guard himself against common physical danger." See *Manual of Instructions for Medical Advisory Boards*, Form 64, Office of the Provost Marshall General (Washington, D.C.: Government Printing Office, 1918), pp. 13–14; see also *Regulations Governing Physical Examinations* (cit. n. 28), p. 11.

[68] For more on the transformation of the army—and especially the limits to that transformation—see Kevles, "Testing the Army's Intelligence" (cit. n. 1), pp. 578–580.

THE ARMY AND THE TESTERS: NEGOTIATING AUTHORITY

The program devised by Yerkes and his fellow intelligence testers must thus be seen as having achieved a modicum of authority in the course of its use by the United States Army, an authority attained in large measure through the willingness of the intelligence testers to adapt themselves and their methods, at least in part, to army needs.[69] The early history of mental testing in the army, as we have seen, involved a series of accommodations by Yerkes and his band of psychologists, in which well-established methods, authoritative within the community of professional psychology, were modified or abandoned entirely in order to persuade a new public, the army, of the worth of the psychologists' endeavors. The equivocal success of the psychological testers even in this program of adaptation reveals much about the processes of negotiation in the formation of authoritative knowledge. Three characteristics stand out.

First, there were limits beyond which neither side was willing to move. This was more obviously the case with the military, which required enormous concessions from Yerkes and his testers before it would seriously consider adopting their program. For example, Goldthwaite Dorr reported that Lieutenant Colonel Schmitter, commander of the Base Hospital at Camp Lee,

> while recognizing very clearly the narrow limitations of the usefulness of the [intelligence] test, and the extreme caution with which it ought to be used, and the danger of laying down any hard and fast rules based upon it as to ability for military service, nevertheless regards it as well worth the time and expense and a system which ought to be used. The persons who devise and make the tests, however, should not have a say as to what extent it should be used.

But it was also true of the psychologists themselves. For all their desire to persuade the army that they could provide valid and useful knowledge, the intelligence testers were willing to modify existing methods only up to a point, because they had themselves to remain convinced that the knowledge they were producing was authentic and would be deemed so by the community of their peers.[70] Thus, Yerkes and his fellow committee members sought to create instruments that would not only meet army needs, but would do so in professionally acceptable ways. The testers accomplished this second objective in large measure, as we have seen, by checking to make sure that their new instruments correlated at least roughly with existing intelligence tests, most often the Stanford-Binet, and that they were constructed out of tests that were already well known and respected within the field of mental measurement.

Second, certain shared terms, in this case *intelligence*, provided both a common language in which negotiation could take place and a locus for dispute. Yerkes and his fellow psychologists were able to persuade the army even to consider adopting intelligence testing only because at least certain members of the high command already believed that intelligence had some bearing on the performance and value of officers and enlisted men. Psychology exploited this belief and gained entrance into the army, but, as we have seen, serious problems then arose. Army officers had their own ideas about intelligence, about what it meant and what its value was. Psychologists thus could not simply impose their knowledge on the military; rather, they had to persuade various members of the officer corps that psychological conceptions of "intelligence" were either better than or at least the same as military notions. Because the sources of authority that mental testers used among themselves to authenticate their ideas about "intelligence" had little direct relevance to military culture, it was psychological knowledge that for the most part had to be adapted to military canons of validity, and even this could be accomplished only partially, at least from the standpoint of the psychologists.

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[69] Kevles comes to much the same conclusion regarding the authority achieved by the intelligence testers: "The army found the tests, together with Scott's qualification ratings, decidedly useful" (*ibid.*, pp. 572–573). Indeed, there was a constant tension between the testers' desire to collect useful scientific information and their desire to be "practical." For more details see Samelson, "Putting Psychology on the Map" (cit. n. 1), pp. 110–111.

[70] Dorr, Office of the Assistant Secretary, War Department, memo on Psychological Tests, Camp Lee—Lieutenant Colonel Schmitter, file 702—Psychological (7-31-18), box 1856, AGO, 1917–1925. For more on the psychologists' concerns with professional integrity see Samelson, "Putting Psychology on the Map," p. 153.

Third, the results of the negotiations over the authority of the psychologists' knowledge depended as much on the perceived relevance of the knowledge claims as on their adjudged validity. While some opponents of intelligence testing within the army withheld their support on the grounds that the tests were not measures of intelligence, the majority of critics emphasized the insufficiency of the measure, rather than its inadequacy, as the salient concern. For them intelligence was simply not of overriding importance; it was merely one of a number of attributes, many of which might carry equal or even far greater weight, that an officer had to assess when evaluating the merits of another soldier. Thus, for the claims of psychologists to achieve authority within the military, the testers had to convince army personnel not only of the validity of their knowledge, but of its utility as well. They had to reshape army culture, making "intelligence" a central aspect of it, before their knowledge could truly gain authority.

Finally, a few concluding observations. First, it is important to note the invisible hands of American Progressivism and American eugenics throughout this story. For the army even to have entertained the notion of adopting "intelligence" as a criterion of evaluation demanded a significant change in the way in which human beings were conceptualized. Victorian emphases on character and moral virtue had to be replaced before notions such as those embodied in "intelligence" could have gained any real provenance. In America, it was the spread during the late nineteenth and early twentieth centuries, especially among the educated and cultural elite, of the scientistic culture known as Progressivism, often heavily tinged with eugenical ideas, that engendered and embodied this transformation.[71] Affecting the military as they did most other sectors of American society, Progressivism and eugenics provided a set of values with which notions drawn from psychology and the other human sciences could resonate. At the very least, Progressivism's effects on the military were to predispose officers, when confronted with problems not amenable to traditional army solutions, to look toward techniques that could be deemed "scientific" as the answer to their needs.

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[71] For a sampling of the enormous literatures on Progressivism and on eugenics see Nell I. Painter, *Standing at Armageddon: The United States, 1877–1919* (New York: Norton, 1989); Robert H. Wiebe, *The Search for Order, 1877–1920* (New York: Hill & Wang, 1967); Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Berkeley: Univ. California Press, 1992); and Daniel J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Berkeley: Univ. California Press, 1986).

Second, the story just told is one uniquely situated in the modern world, in the world of mass, anonymous society. The techniques developed by the psychologists would have had little place within, and indeed would have been given little hearing by, the army if that institution had remained at its intimate prewar level. Even the supporters of the introduction of intelligence testing into the army acknowledged that it was the rapid growth in size, and the consequent impracticality of continuing to rely on personal knowledge, that induced them to turn to mental tests. Thus, this episode may offer insight into the problem of why the efflorescence of psychology and many other human sciences occurred at the end of the nineteenth century, when throughout the West the accelerated forces of urbanization had both transformed the realities of, and stripped away many of the illusions about, the small-town nature of social life.

Third, the history of "intelligence" and the American military underscores the importance of forms, and tests, and collected records in the transformation of culture. Like books, articles, and public presentations, objects can act as mediators between the realms of high ideas and those of everyday life. Michel Foucault, in *Discipline and Punish,* has already reminded historians of the great importance of these microrealms of power.[72] The story of the introduction of "intelligence" into the American army in essence confirms his hypothesis. "Intelligence" spread throughout the military in large part because it was translated into technologies—rating cards and intelligence tests—from which most army personnel simply could not escape. In the process, both officers and enlisted men were forced to think in concrete terms about "intelligence," about what it might mean and what its importance might be. The explosive growth of intelligence testing in America in the immediate postwar period, occurring after those exposed to "intelligence" and its tests had returned to civilian life, is perhaps the most dramatic indication of the transformative power of the bureaucratized word.[73]

Finally, the story of the intersection of psychology and the military during World War I is no straightforward tale of the transfer of knowledge, undisturbed, from one context to another. Rather, it is one of negotiation and alteration, in which the knowledge producers, the audiences for the knowledge produced, and the knowledge itself all changed in the process of adapting to a new cultural location. Three characteristics of the process of creating and adapting scientific knowledge stand out. First, as we have seen, the process was multivalent, strongly shaped not only by those who sought to produce scientific knowledge, the psychologists, but also by the audience for which it was produced, in this case the military. Second, the granting of authority to a particular unit of knowledge—be it a concept, an instrument, or a technique—occurred only after complex evaluations took place assessing validity, relevance, and costs vis-à-vis the needs of its targeted public, and here the outcome was determined by particular and local distributions of social, economic, and epistemic power.[74] And third, knowledge production involved transformation, not only of the producers of the knowledge—the psychologists—and of the public—the military—that was being persuaded, but also of the knowledge itself, as it was continually redirected and modified in order to accomplish its persuasive tasks. We are thus left with a process in which the authority of scientific knowledge is variable, changing over both time and cultural location in response to its successes and failures in meeting the demands and evaluative criteria of the constituency for whom it is constructed.

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[72] See esp. the section on the examination in Michel Foucault, *Discipline and Punish* (New York: Vintage, 1979). For a related and somewhat more historical discussion of these issues see Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society: Studies in the Sociology of Culture Past and Present,* 1986, *6*:1–40.

[73] Samelson makes a similar point in "Putting Psychology on the Map" (cit. n. 1), p. 155.

[74] Of course, persuasion is only one of the means by which an individual or a group of individuals acts according to the bidding of another. A second, which I have not discussed in this article, is coercion, although it, too, is an important part of this story, as it must be in any story involving hierarchical distributions of power, like those of the military or of science.